WHAT IS CLAIMED IS:

Sub a1> 1. A light-weight golf club shaft comprising:

a first angled layer;

a first straight layer formed on said first angled layer;

a second angled layer formed on said first straight layer;

a second straight layer formed on said second angled layer;

said shaft having a length along a longitudinal direction;

each of said layers extend over said length of said shaft and includes fiber-reinforced composite material, said fiber-reinforced composite material containing reinforcing fibers;

said reinforcing fibers of said second angled layer being oriented at an angle relative to said longitudinal direction of said shaft; and

said second angled having at least one of said angle and a thickness effective provide said shaft with a torsional strength of at least 120 kgf×m×degrees and a weight of from 30 to 40 g.

2. A light-weight golf club shaft according to claim 1, wherein said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 35 to 75 degrees relative to said longitudinal direction of said shaft.

3. A light-weight golf club shaft according to claim 1, wherein said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 60 to 75 degrees relative to said longitudinal direction of said shaft.

4. A light-weight golf club shaft according to claim 1, wherein said reinforcing fibers of said second angled layer are oriented at an angle in a range from 65 to 70 degrees relative to said longitudinal direction of said shaft.

5. A light-weight golf club shaft according to claim 1, wherein said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm.

6. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 35 to 75 degrees relative to said longitudinal direction of said shaft; and

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm.

7. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 60 to 75 degrees relative to said longitudinal direction of said shaft; and

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm.

8. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range from 65 to 70 degrees relative to said longitudinal direction of said shaft; and

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm.

9. A light-weight golf club shaft according to claim 1, wherein said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

10. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 35 to 75 degrees relative to said longitudinal direction of said shaft; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

11. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 60 to 75 degrees relative to said longitudinal direction of said shaft; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

12. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 65 to 70 degrees relative to said longitudinal direction of said shaft; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

13. A light-weight golf club shaft according to claim 1, wherein:

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

14. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 35 to 75 degrees relative to said longitudinal direction of said shaft;

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

15. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 60 to 75 degrees relative to said longitudinal direction of said shaft;

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

16. A light-weight golf club shaft according to claim 1, wherein:

said reinforcing fibers of said second angled layer are oriented at an angle in a range of from 65 to 70 degrees relative to said longitudinal direction of said shaft;

said layers are effective to provide said shaft with a crushing strength of at least 10 kg/10 mm; and

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm.

17. A light-weight golf club shaft according to claim 1, wherein:

said shaft has a small-diameter end and a large-diameter end;

said first angled layer has a first thickness near said small-diameter end of said shaft;

said first angled layer has a second thickness near said large-diameter end of said shaft; and

said first thickness is substantially twice said second thickness.

Sub a2 18. A light-weight golf club shaft according to claim 1, wherein said reinforcing fibers include organic, inorganic and metal reinforcing fibers.

19. A light-weight golf club shaft, said shaft having a length along a longitudinal direction, comprising:

a first angled layer;

a first straight layer formed on said first angled layer;

a second angled layer formed on said first straight layer;

a second straight layer formed on said second angled layer;

each of said layers extend over said length of said shaft and include fiber-reinforced composite material, said fiber-reinforced composite material containing reinforcing fibers;

said reinforcing fibers of said second angled layer oriented at an angle in a range of from 35 to 75 degrees relative to said longitudinal direction of said shaft;

said second angled layer has a thickness in a range of from 0.04 to 0.1 mm;

said shaft has a small-diameter end and a large-diameter end;

said first angled layer has a first thickness near said small-diameter end of said shaft;

said first angled layer has a second thickness near said large-diameter end of said shaft;

said first thickness is substantially twice said second thickness; and

said layers are effective to provide said shaft with a torsional strength of at least 120 kgf × m × degrees and a weight of from 30 - 40 g.

20. A method for forming a golf club shaft around a mandrel having a length along a longitudinal axis, the steps comprising:

forming a first reinforcement layer from a first fiber material, said first fiber material having fibers aligned along a single direction;

forming a first angled layer from second and third fiber material, said second and third materials having fibers aligned along a single direction;

bonding said second and third materials together to form said first angled layer, such that said fibers of said second material form a first angle with said fibers of said third material;

forming a first straight layer from a fourth fiber material, said fourth fiber material having fibers aligned along a single direction;

forming a second angled layer from fifth and sixth fiber material, said fifth and sixth materials having fibers aligned along a single direction;

bonding said fifth and sixth fiber materials together to form said second angled layer, such that said fibers of said fifth and sixth material form a second angle in the range of from 70-150 degrees and said second angled layer has a thickness in the range of from 0.04 to 0.1 mm;

forming a second straight layer from a seventh fiber material, said seventh fiber material having fibers aligned along a single direction;

forming a second reinforcement layer from an eighth fiber material, said fiber material having fibers aligned along a single direction;

wrapping said first reinforcement layer around said mandrel such that said fibers of said first reinforcement layer are aligned 90 degrees with respect to said longitudinal axis;

wrapping said first angled layer around said first reinforcement layer such that said first angle of said fiber material of said first angled layer is bisected by said longitudinal axis;

wrapping said first straight layer around said first angled layer such that said fibers of said first straight layer are aligned with said longitudinal axis;

wrapping said second angled layer around said first straight layer such that said second angle of said fiber material of said second angled layer is bisected by said longitudinal axis;

wrapping said second straight layer around said second angled layer such that said fibers of said second straight layer are aligned with said longitudinal axis;

wrapping second reinforcement layer around said second straight layer to form a layered wrap, such that said fibers of said second reinforcement layer are aligned with said longitudinal axis;

curing said layered wrap in an oven to form a cured shaft;

removing said mandrel from said cured shaft; and

trimming ends said cured shaft to produce said golf club shaft.

add C2

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